

INTERNATIONAL RECTIFIER



1N3879, 1N3889, 6FL, 12FL, 16FL SERIES

**6A, 12A and 16A Fast
Recovery Rectifiers**

Major Ratings and Characteristics

| | 1N3879 —1N3883 | 1N3889 —1N3893 | 6FL... | 12FL... | 16FL... | Unit | |
|---------------------|-------------------|-------------------|-----------|---------|---------|--------------|------------------|
| $I_F(AV)^{\dagger}$ | 6* | 12* | 6 | 12 | 16 | A | |
| I_{FSM} | 50Hz | 72 | 145 | 110 | 145 | 180 | A |
| | 60Hz | 75* | 150* | 115 | 150 | 190 | A |
| I^2t | 50Hz | 26 | 103 | 60 | 103 | 160 | A ² s |
| | 60Hz | 23 | 94 | 55 | 94 | 150 | A ² s |
| $I_A\sqrt{t}$ | 363 | 1452 | 855 | 1452 | 2290 | A \sqrt{s} | |
| t_{rr} range | see table | | | | | ns | |
| V_{RRM} range | 50 — 400* | | 50 — 1000 | | | V | |
| T_J range | —65 to 150 | | | | | °C | |

*JEDEC registered values.

† At max. $T_C = 100^\circ\text{C}$.

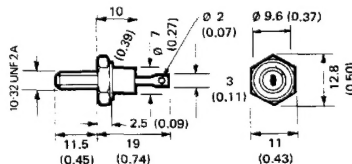
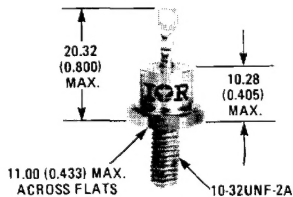
Description

This range of fast recovery diodes is designed for applications in DC power supplies, inverters, converters, choppers, ultrasonic systems and for use as free wheel diodes.

Features

- Short reverse recovery time
- Low stored charge
- Wide current range
- Excellent surge capabilities
- Standard JEDEC types
- Stud cathode and stud anode versions
- Types up to 1000V V_{RRM}
- Fully characterised reverse recovery conditions

CASE STYLE AND DIMENSIONS



Conforms to JEDEC: DO-203AA (DO-4)
IEC 191-2: A3U
BS 3934: SO-10A
DIN 41885: 101 C 2

All dimensions in millimetres (inches)

REVERSE VOLTAGE RATINGS

| Part Number ① ② | | | VRRM – Max. Repetitive Peak Reverse Voltage | VRRM – Max. Non-Repetitive Peak Reverse Voltage $t_p \leq 5 \text{ ms}$ | IR – Max. Reverse Current At Rated V_R | | |
|-----------------|------------|------------|---|--|---|---------------------------|---------------------------|
| | | | V | V | $T_J = 25^\circ\text{C}$ | $T_J = 100^\circ\text{C}$ | $T_J = 150^\circ\text{C}$ |
| | | | | | μA | mA | mA |
| | 1N3879 | | 50 | 75 | 0.015* | 1.0* | 3.0* |
| | 1N3880 | | 100 | 150 | 0.015* | 1.0* | 3.0* |
| | 1N3881 | | 200 | 250 | 0.015* | 1.0* | 3.0* |
| | 1N3882 | | 300 | 350 | 0.015* | 1.0* | 3.0* |
| | 1N3883 | | 400 | 450 | 0.015* | 1.0* | 3.0* |
| | 1N3889 | | 50 | 75 | 0.025* | 3.0* | 5.0* |
| | 1N3890 | | 100 | 150 | 0.025* | 3.0* | 5.0* |
| | 1N3891 | | 200 | 250 | 0.025* | 3.0* | 5.0* |
| | 1N3892 | | 300 | 350 | 0.025* | 3.0* | 5.0* |
| | 1N3893 | | 400 | 450 | 0.025* | 3.0* | 5.0* |
| **6FL6S02 | 6FL6S05 | 6FL6S10 | 50 | 75 | 0.050 | — | 6.0 |
| 6FL10S02 | 6FL10S05 | 6FL10S10 | 100 | 150 | 0.050 | — | 6.0 |
| 6FL20S02 | 6FL20S05 | 6FL20S10 | 200 | 275 | 0.050 | — | 6.0 |
| 6FL40S02 | 6FL40S05 | 6FL40S10 | 400 | 500 | 0.050 | — | 6.0 |
| 6FL60S02 | 6FL60S05 | 6FL60S10 | 600 | 725 | 0.050 | — | 6.0 |
| — | 6FL80S05 | 6FL80S10 | 800 | 950 | 0.050 | — | 6.0 |
| — | 6FL100S05 | 6FL100S10 | 1000 | 1250 | 0.050 | — | 6.0 |
| **12FL5S02 | 12FL5S05 | 12FL5S10 | 50 | 75 | 0.050 | — | 6.0 |
| 12FL10S02 | 12FL10S05 | 12FL10S10 | 100 | 150 | 0.050 | — | 6.0 |
| 12FL20S02 | 12FL20S05 | 12FL20S10 | 200 | 275 | 0.050 | — | 6.0 |
| 12FL40S02 | 12FL40S05 | 12FL40S10 | 400 | 500 | 0.050 | — | 6.0 |
| 12FL60S02 | 12FL60S05 | 12FL60S10 | 600 | 725 | 0.050 | — | 6.0 |
| — | 12FL80S05 | 12FL80S10 | 800 | 950 | 0.050 | — | 6.0 |
| — | 12FL100S05 | 12FL100S10 | 1000 | 1250 | 0.050 | — | 6.0 |
| **16FL5S02 | 16FL5S05 | 16FL5S10 | 50 | 75 | 0.050 | — | 6.0 |
| 16FL10S02 | 16FL10S05 | 16FL10S10 | 100 | 150 | 0.050 | — | 6.0 |
| 16FL20S02 | 16FL20S05 | 16FL20S10 | 200 | 275 | 0.050 | — | 6.0 |
| 16FL40S02 | 16FL40S05 | 16FL40S10 | 400 | 500 | 0.050 | — | 6.0 |
| 16FL60S02 | 16FL60S05 | 16FL60S10 | 600 | 725 | 0.050 | — | 6.0 |
| — | 16FL80S05 | 16FL80S10 | 800 | 950 | 0.050 | — | 6.0 |
| — | 16FL100S05 | 16FL100S10 | 1000 | 1250 | 0.050 | — | 6.0 |

REVERSE RECOVERY CHARACTERISTICS

| | 1N3879– 1N3883 | 1N3889– 1N3893 | 6FL... | | | 12FL... | | | 16FL... | | | Unit | Conditions |
|---|-------------------|-------------------|--------|------|------|---------|------|------|---------|------|------|------|--|
| | | | S02 | S05 | S10 | S02 | S05 | S10 | S02 | S05 | S10 | | |
| t_{rr} Max. reverse recovery time | 150 | 150 | 110 | 285 | 490 | 100 | 250 | 430 | 90 | 225 | 390 | ns | $T_J = 25^\circ\text{C}$, $I_F = 1\text{A}$ to $V_R = 30\text{V}$ $dI_F/dt = 100\text{ A}/\mu\text{s}$ |
| | 300* | 300* | 200 | 500 | 1000 | 200 | 500 | 1000 | 200 | 500 | 1000 | ns | $T_J = 25^\circ\text{C}$, $dI_F/dt = 25\text{ A}/\mu\text{s}$ |
| $I_{RM}(\text{REC})$ Max. peak reverse recovery current | 4* | 5* | — | — | — | — | — | — | — | — | — | — | $I_{FM} = \pi \times \text{rated } I_F(\text{AV})$ |
| Q_{RR} Max. reverse recovered charge | 400 | 350 | 230 | 1700 | 5000 | 200 | 1300 | 3800 | 150 | 1100 | 3000 | nC | $T_J = 25^\circ\text{C}$, $I_F = 1\text{A}$ to $V_R = 30\text{V}$ $dI_F/dt = 100\text{ A}/\mu\text{s}$ |
| | 400 | 400 | 200 | 1200 | 5000 | 200 | 1200 | 5000 | 200 | 1200 | 5000 | nC | $T_J = 25^\circ\text{C}$, $dI_F/dt = 25\text{ A}/\mu\text{s}$ $I_{FM} = \pi \times \text{rated } I_F(\text{AV})$ |

ELECTRICAL SPECIFICATIONS

| | | 1N3879– 1N3883 | 6FL... | 1N3889– 1N3893 | 12FL... | 16FL... | Unit | Conditions | |
|--------------------|--|-------------------|--------|-------------------|---------|----------------------|--|----------------------|---|
| FORWARD CONDUCTION | | | | | | | | | |
| $I_F(\text{AV})$ | Max. average forward current | 6* | 6 | 12* | 16 | A | 180° conduction, half sine wave, $T_C = 100^\circ\text{C}$ | | |
| $I_F(\text{RMS})$ | Max. r.m.s. forward current | 9.5 | 9.5 | 19 | 25 | A | | | |
| I_{FSM} | Max. peak one-cycle non-repetitive forward current | 72 | 110 | 145 | 180 | A | $t = 10\text{ ms}$ | With rated V_{RRM} | Sinusoidal half wave, initial $T_J = 150^\circ\text{C}$ |
| | | 75* | 115 | 150* | 190 | | $t = 8.3\text{ ms}$ | | |
| | | 85 | 130 | 170 | 215 | | $t = 10\text{ ms}$ | | |
| | | 90 | 135 | 180 | 225 | | $t = 8.3\text{ ms}$ | | |
| i^2_t | Max. i^2_t for fusing | 26 | 60 | 103 | 160 | A^2s | $t = 10\text{ ms}$ | With rated V_{RRM} | Initial $T_J = 150^\circ\text{C}$ |
| | | 23 | 55 | 94 | 150 | | $t = 8.3\text{ ms}$ | | |
| | Max. i^2_t for individual device fusing | 36 | 86 | 145 | 230 | | $t = 10\text{ ms}$ | | |
| | | 33 | 78 | 130 | 210 | | $t = 8.3\text{ ms}$ | | |
| $i^2 \sqrt{t}$ | Max. $i^2 \sqrt{t}$ for individual device fusing ① | 363 | 856 | 1452 | 2290 | $i^2 \sqrt{t}$ | $t = 0.1$ to 10 ms | | |
| V_{FM} | Max. peak forward voltage | 1.4* | 1.4 | 1.4* | 1.4 | V | $T_J = 25^\circ\text{C}$, $I_F = \text{rated } I_F(\text{AV})$ (D.C.) | | |
| | | 1.5* | 1.5 | 1.5* | 1.5 | | $T_C = 100^\circ\text{C}$, $I_{FM} = \pi \times \text{rated } I_F(\text{AV})$ | | |

* JEDEC registered value

** Suffix "S02" may be omitted, i.e., 12FL10 implies 12FL10S02, 12FLR60 implies 12FLR60S02.

① Types listed are cathode to case; for anode-to-case include "R" in code, i.e., 1N3879R, 6FLR20S10, 16FLR40S02.

② $I_R(\text{AV})$ @ rated $I_F(\text{AV})$ and V_{RRM} , and $T_C = 100^\circ\text{C}$.③ I_{RM} @ rated V_{RRM} and $T_J = 150^\circ\text{C}$.④ i^2_t for time $t_x = i^2 \sqrt{t} \times \sqrt{x}$

⑤ When these devices are ordered without a suffix, e.g., 40HFL, the order will be filled with devices that meet the S02 specification.

Thermal and mechanical specifications

| | | | 1N3879 -1N3883 6FL... | 1N3889 -1N3893 12FL... | 16FL... | Units | Conditions |
|------------|---|--------------|-----------------------------|------------------------------|---------|--------------------|--|
| T_J | Junction operating temperature range | | -65 to 150 | | | $^{\circ}\text{C}$ | |
| T_{stg} | Storage temperature range | | -65 to 175 | | | $^{\circ}\text{C}$ | |
| R_{thJC} | Maximum internal thermal resistance, junction to case | | 2.5 | 2.0 | 1.6 | deg C/W | DC operation |
| R_{thCS} | Maximum thermal resistance, case to heatsink | | 0.5 | | | deg C/W | Mounting surface flat, smooth and greased. |
| T | Mounting torque $\pm 10\%$ | to nut | 10.5 | | | lbf.in | Lubricated threads (Non-lubricated threads) |
| | | | 0.12 | | | kgf.m | |
| | | | 1.2 | | | Nm | |
| | to device | 11.5 (13.5) | | | lbf.in | | |
| | | 0.13 (0.155) | | | kgf.m | | |
| wt | Approximate weight | to device | 1.3 (1.35) | | | Nm | |
| | | | 7 | | | g | |
| | | | 0.25 | | | oz | |
| Case style | | | DO-203AA (DO-4) | | | JEDEC | |

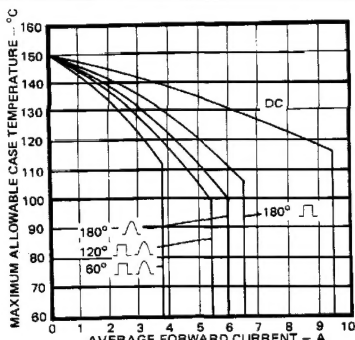


Fig. 1 - Average Forward Current Vs. Maximum Allowable Case Temperature, 1N3879 and 6FL Series

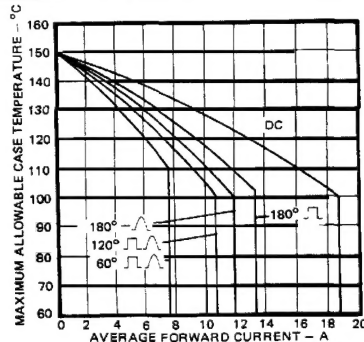


Fig. 2 - Average Forward Current Vs. Maximum Allowable Case Temperature, 1N3889 and 12FL Series

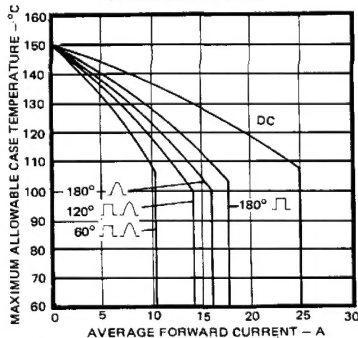
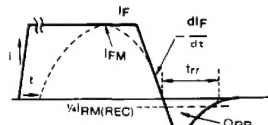
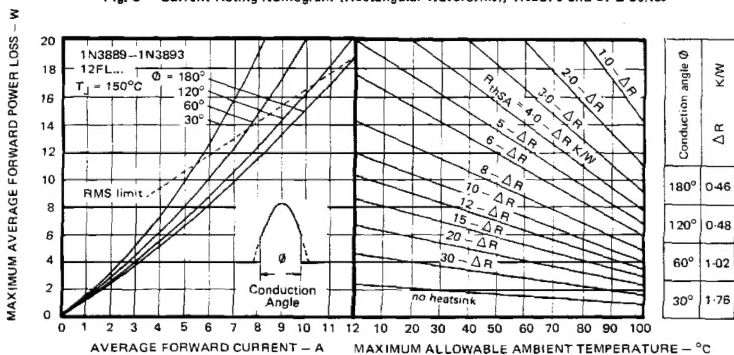
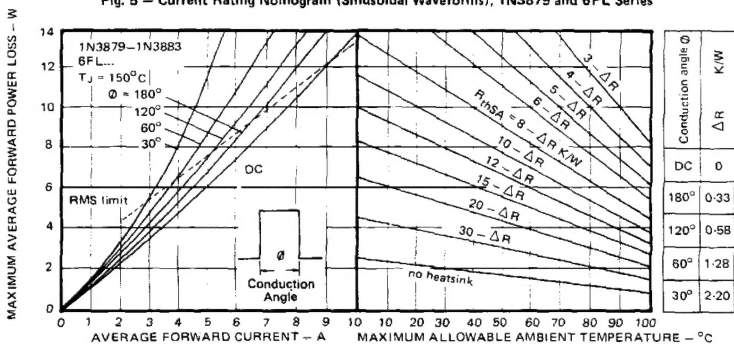
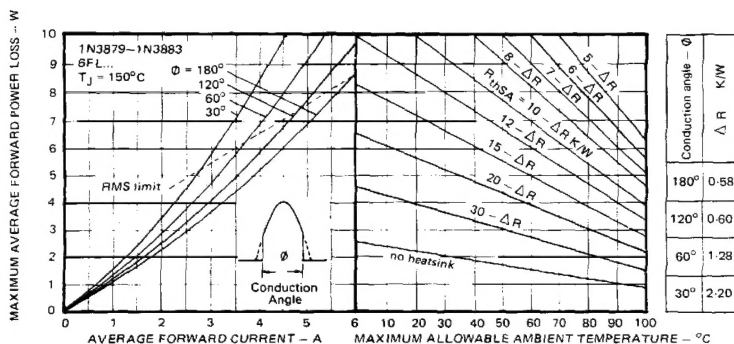


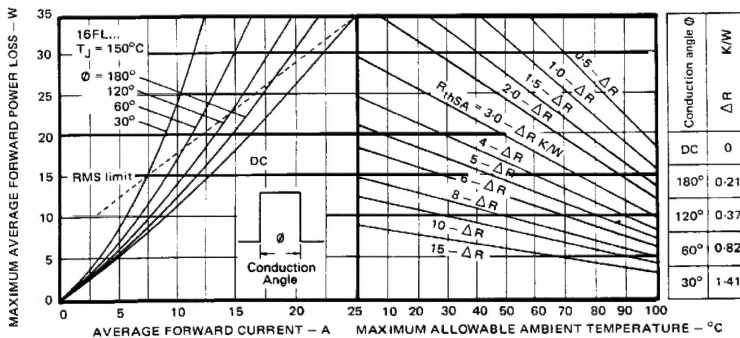
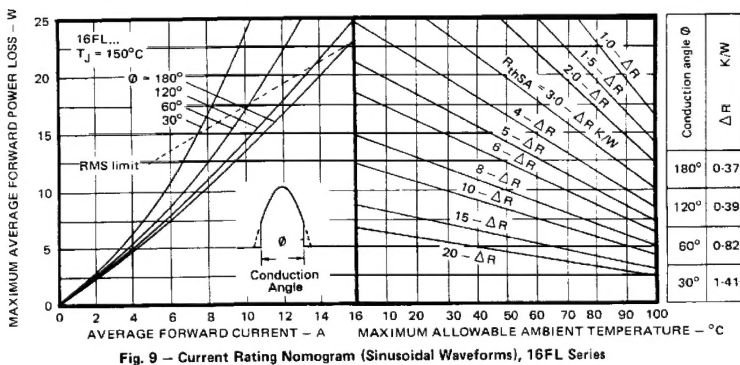
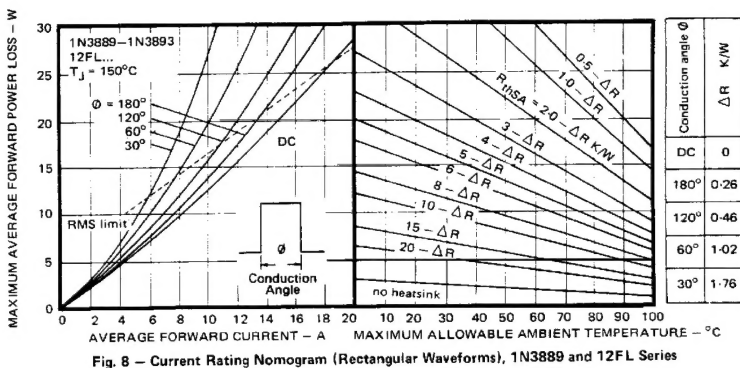
Fig. 3 - Average Forward Current Vs. Maximum Allowable Case Temperature, 16FL Series



- I_F, I_{FM} = Peak forward current prior to commutation
 $-dI_F/dt$ = Rate of fall of forward current
 $I_{RM}(REC)$ = Peak reverse recovery current
 t_{rr} = Reverse recovery time
 Q_{RR} = Reverse recovered charge

Fig. 4 - Reverse Recovery Time Test Waveform





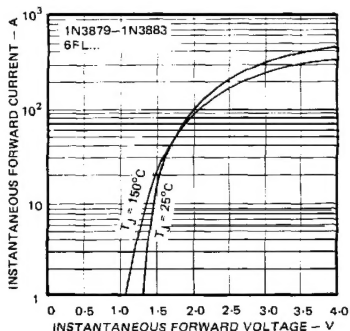


Fig. 11 - Maximum Forward Voltage Vs. Forward Current, 1N3879 and 6FL Series

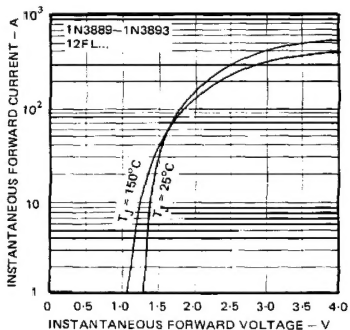


Fig. 13 - Maximum Forward Voltage Vs. Forward Current, 1N3889 and 12FL Series

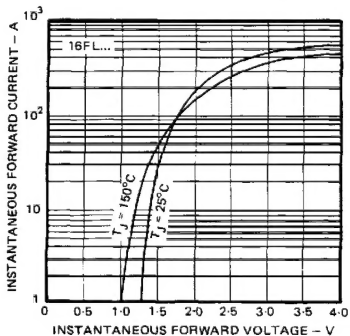


Fig. 15 - Maximum Forward Voltage Vs. Forward Current, 16FL Series

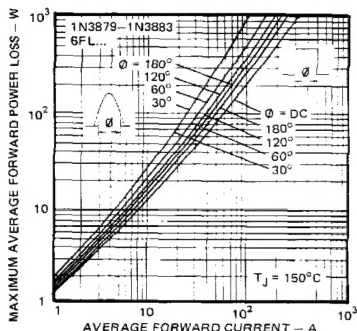


Fig. 12 - Maximum High Level Forward Power Loss Vs. Average Forward Current, 1N3879 and 6FL Series

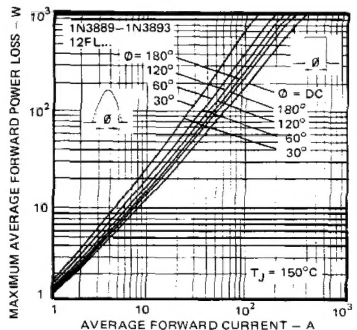


Fig. 14 - Maximum High Level Forward Power Loss Vs. Average Forward Current, 1N3889 and 12FL Series

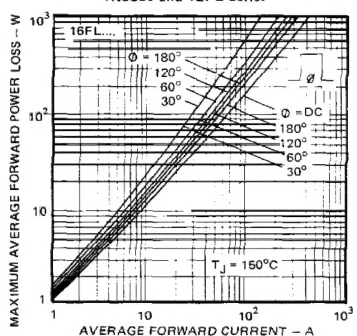


Fig. 16 - Maximum High Level Forward Power Loss Vs. Average Forward Current, 16FL Series

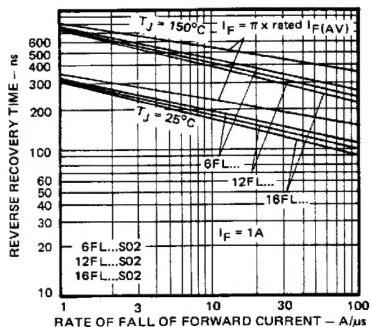


Fig. 17A - Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series __S02

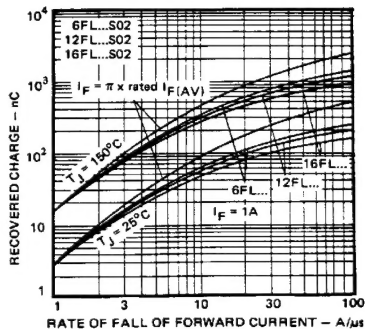


Fig. 17B - Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series __S02

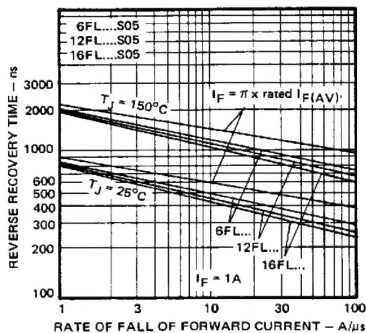


Fig. 18A - Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series __S05

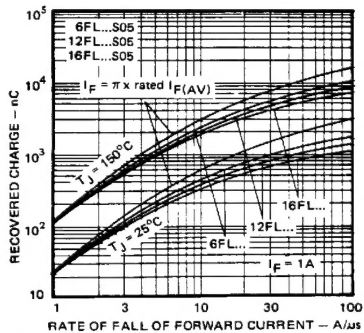


Fig. 18B - Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series __S05

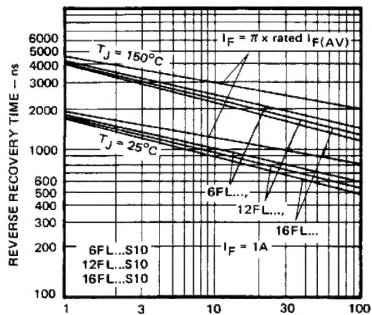


Fig. 19A - Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series __S10

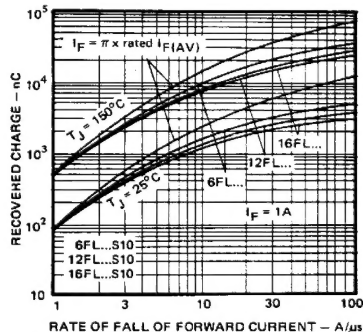


Fig. 19B - Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series __S10

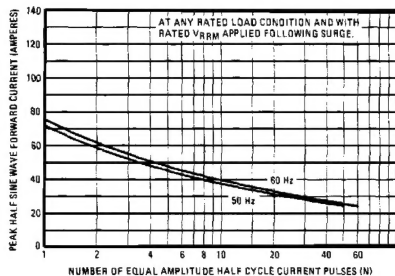


Fig. 20 - Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 1N3879 Series

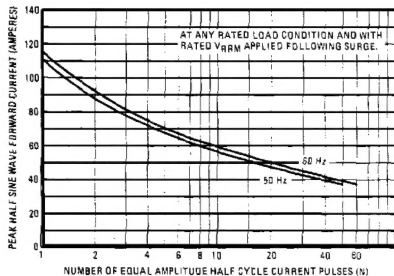


Fig. 21 - Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 6FL Series

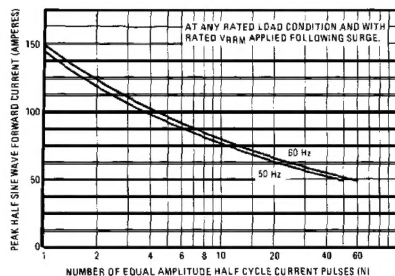


Fig. 22 - Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 1N3889 and 12FL Series

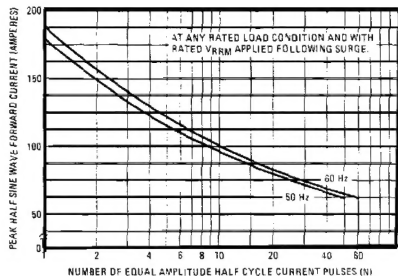


Fig. 23 - Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 16FL Series

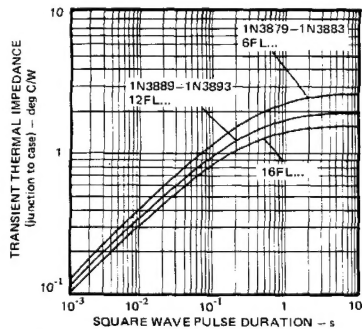


Fig. 24 - Maximum Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration, All Series.